Banisteria, Number 9, 1997

Freshwater Fishes of an Isolated, Interdunal Freshwater Ecosystem in Northern Virginia Beach, Virginia

Joseph C. Mitchell

Department of Biology and School of Continuing Studies
University of Richmond
Richmond, Virginia 23173

Kurt A. Buhlmann[1]

Department of Conservation and Recreation
Division of Natural Heritage
1500 E. Main St., Suite 312
Richmond, Virginia 23219

and

Mitchell D. Norman

Virginia Department of Game and Inland Fisheries
5628-B Godwin Blvd.
Suffolk, Virginia 23434

The freshwater cypress-gum swamps located among dune ridges along the Atlantic coast of southeastern Virginia are a series of shallow wetlands that seldom dry completely. Most of the extant swamps are located at the northern end of the City of Virginia Beach, Virginia, in Seashore State Park and Natural Area. The park is a unique natural area and recreation site that receives several million visitors annually. The area is also unique because it supports populations of rare and geographically disjunct species (Clampitt, 1991; Henry, 1993). A small portion of the park lies along the southern shore of the Chesapeake Bay, but the majority of the park and all of the designated natural area are behind the coastal dunes and beaches.

Seashore State Park supports a series of secondary dunes, swales, interdunal cypress swamps and ponds, a forest of loblolly pine (*Pinus taeda*), water oak (*Quercus nigra*), hickories (*Carya* sp.), red maple (*Acer rubrum*), redbay (*Persea borbonia*), black gum (*Nyssa sylvatica*), and cypress (*Taxodium distichum*), and the tidal-influenced Broad Bay (Wright et al., 1990; Clampitt, 1991). It originally included the portion of Cape Henry that is now utilized by the U.S. Army as Fort Story (Adkins, 1990). A narrow strip of city residential homes lies along U.S. Rt. 60 (Atlantic Avenue) and separates the park from the Atlantic Ocean to the east. Aquatic habitats in the park other than interdunal swamps and ponds include the Chesapeake Bay, Long Creek, and Broad Bay. The latter

[1] Present address: University of Georgia, Savannah River Ecology Laboratory, Drawer E, Aiken, South Carolina 29802)

separates the park from the highly urbanized City of Virginia Beach to the south.

Seashore State Park is well known for its flora and fauna, having been the subject of investigations on plants (Egler, 1942; Wright et al., 1990; Clampitt, 1991), amphibians and reptiles (Werler & McCallion, 1951; Buhlmann et al., 1993; Mitchell, 1994; Buhlmann, 1995), and small mammals (Buhlmann et al., 1993). Although the fishes of the Chesapeake Bay and its tidal reaches are well known (Murdy et al., 1997), the freshwater fishes of the interdunal freshwater swamps have not been studied systematically. Jenkins & Burkhead (1994) included Seashore State Park on the distribution maps of four species, one of which was based on an unverified report. They also reported the mummichog (*Fundulus heteroclitus*) from tidal areas. In this paper we review the known freshwater fish fauna of the interdunal cypress-gum swamps in this unique ecosystem in southeastern Virginia and add an additional six species to the checklist.

Information reported herein is derived from specimens collected and observations made during 1980-1987 and in 1989. Most of the fish were collected in turtle traps made of chickenwire (Iverson, 1979), but some were obtained with dipnets and minnow traps. All specimens have been donated to the Virginia Institute of Marine Science in Gloucester Point.

A total of 10 species of freshwater fish were collected or observed in the cypress swamps of Seashore State Park during this survey. The habitat of each species consists of shallow, dark, acidic water with varying depths of decomposing organic matter on the bottom. All of the swamps sampled are located in the vicinity of the park's nature and environmental education centers in the interior of the park.

1. *Acantharchus pomotis* - Three specimens of the mud sunfish (92, 120, 162 mm standard length [SL]) were collected on 15 September 1984 and two (114 and 152 mm) on 12 September 1985. JCM and KAB observed this species frequently in turtle traps set in shallow ponds near the Nature Center and Environmental Education Center in the 1980s. A total of 13 were caught in five minnow traps on 22 December 1989. Jenkins and Burkhead (1994) illustrated a record for Seashore State Park.

2. *Amia calva* - JCM observed an adult bowfin in a large and deep, interdunal, cypress-gum swamp on 19 September 1984. Jenkins & Burkhead (1994) included a record for Seashore State Park.

3. *Aphredoderus sayanus* - A total of 14 pirate perch were collected on 15 September 1984. The series averaged 65.1 ± 19.3 mm SL (36-95 mm). New record.

4. *Centrarchus macropterus* - Fliers were the most common fish encountered in the interdunal cypress swamps, many of which were caught in turtle traps. Two (42 and 50 mm SL) were collected on 15 September 1984. Four were caught in five minnow traps on 2 December 1989 and 42 were caught on 22 December 1989. New record.

5. *Chologaster cornuta* - A single specimen of the swampfish (27 mm SL) was collected on 14 August 1984 in the interdunal pond adjacent to the nature center by Bonnie J. Larson. Its occurrence in Seashore State Park noted by Jenkins & Burkhead (1994) is based on a personal communication about this specimen from C.A. Pague. KAB observed an adult in an interdunal swamp adjacent to the access road on 14 November 1989.

6. *Enneacanthus obesus* - Two banded sunfish (69 and 80 mm sl) were collected on 15 September 1984. New record.

7. *Esox niger* - One chain pickerel measuring 265 mm SL was caught on 15 September 1984. New record.

8. *Gambusia holbrooki* - This native species was reported for Seashore State Park by Jenkins & Burkhead (1994).

9. *Lepomis gulosus* - Two warmouth (101 and 144 mm SL) were caught on 12 May 1987. New record.

10. *Umbra pygmaea* - Eastern mudminnows were collected on 16 August 1980 (34 mm SL) and 15 September 1984 (52, 57, 58, 63 mm SL). Several were observed during 4 July - 5 December 1989. New record.

The wetlands supporting these fish populations may be relics of a much more extensive system of interdunal swales and freshwater swamps and ponds that existed during the Pleistocene (Oats & Coch, 1973). Rising sea levels since the last glaciation eliminated many of these wetlands in southeastern Virginia and northeastern North Carolina. The populations and genetic lineages of the native species in Seashore State Park are probably at least as old as the Pleistocene.

Jenkins & Burkhead (1994) pointed out that four of the ten species recorded here (chain pickerel, mudminnow, pirate perch, and swampfish) seem localized

in the area. Their distribution patterns may be artifacts of collecting effort and alteration of wetlands by human activities. Nevertheless, the freshwater fish fauna of Seashore State Park more closely resembles that of the Great Dismal Swamp than the fish in the freshwater ponds among the dunes in Nags Head Woods on the Outer Banks of North Carolina. Norman et al. (in press) lists 32 species (including six introduced species) for Lake Drummond and adjacent drainage ditches in the Great Dismal Swamp National Wildlife Refuge. These include all of the species now verified for Seashore State Park. The freshwater ponds in Nags Head Woods contain seven species, only one of which (*Gambusia holbrooki*) also occurs in the swamps of Seashore State Park. In contrast, the herpetofaunas of Seashore State Park (Buhlmann et al., 1993; J.C. Mitchell and C.A. Pague, unpublished), Great Dismal Swamp (Mitchell et al., in press), and Nags Head Woods (Braswell, 1988) are all similar.

The freshwater fish fauna in the cypress-gum swamps of Seashore State Park appeared to be stable in the 1980s. Our observations throughout that period suggested no changes in abundance. Management of this vertebrate assemblage in the interdunal ponds could be accomplished by allowing the dune-swamp ecosystem to remain intact and unaltered, and by preventing introductions of fish and other vertebrates derived from other locations.

ACKNOWLEDGMENTS

Christopher A. Pague, Bonnie J. Larson, Maureen Hudson, Alan H. Savitzky, David A. Young, and numerous park personnel assisted in the field during our excursions to Seashore State Park. C. A. Pague provided several fish specimens. We thank Park Superintendent Fred Hazelwood for his support of our field studies. Robert E. Jenkins reviewed the manuscript. The Virginia Department of Conservation and Recreation provided permits. Manuscript preparation was supported in part by Financial Assistance Award Number DE-FC09-96SR18546 from the U.S. Department of Energy to the University of Georgia Research Foundation.

LITERATURE CITED

Adkins, L. M. 1990. Seashore State Park: a walking guide. Tidewater Publishers, Centreville, MD. 64 pp.

Braswell, A. L. 1988. A survey of the amphibians and reptiles of Nags Head Woods Ecological Preserve. ASB Bulletin 35:199-217.

Buhlmann, K. A. 1995. Habitat use, terrestrial movements, and conservation of the turtle, *Deirochelys reticularia* in Virginia. Journal of Herpetology 29:173-181.

Buhlmann, K. A., J. C. Mitchell, & C. A. Pague. 1993. Amphibian and small mammal abundance and diversity in saturated forested wetlands and adjacent uplands of southeastern Virginia. Pp. 1-7 In S. D. Eckles, A. Jennings, A. Spingarn, and C. Weinhold (eds.), Proceedings of a Workshop on Saturated Forested Wetlands in the Mid-Atlantic Region: The State of the Science. U.S. Fish and Wildlife Service, Annapolis, MD.

Clampitt, C. A. 1991. The upland plant communities of Seashore State Park, Virginia. Virginia Journal of Science 42:419-435.

Egler, F. E. 1942. Check list of the ferns and flowering plants of the Seashore State Park, Cape Henry, Virginia. Mimeographed Publication, New York State College of Forestry, Syracuse, NY. 60 pp.

Henry, T. J. 1993. A striking new genus and species of bryocorine plant bug (Heteroptera: Miridae) from eastern North America. Jeffersoniana 2:1-9.

Iverson, J. B. 1979. Another inexpensive turtle trap. Herpetological Review 10:55.

Jenkins, R. E., & N. M. Burkhead. 1994. Freshwater Fishes of Virginia. American Fisheries Society, Bethesda, MD. 1080 pp.

Mitchell, J. C. 1994. The Reptiles of Virginia. Smithsonian Institution Press, Washington, D.C. 352 pp.

Mitchell, J. C., C. A. Pague, & D. J. Schwab. In press. Herpetofauna of the Great Dismal Swamp. In R. K. Rose (ed.), Proceedings of the Third Symposium on the Great Dismal Swamp. Old Dominion University, Norfolk, VA.

Murdy, E. O., R. S. Birdsong, and J. A. Musick. 1997. Fishes of the Chesapeake Bay. Smithsonian Institution Press, Washington, D.C. 496 pp.

Norman, M. D., R. T. Eades, & G. L. Swihart. In press. Fishes of the Great Dismal Swamp, Virginia. In R. K. Rose (ed.), Proceedings of the Third Symposium on the Great Dismal Swamp. Old Dominion University, Norfolk, VA.

Oats, R. Q., & N. K. Coch. 1973. Post-Miocene stratigraphy and morphology, southeastern Virginia. Virginia Division of Mineral Resources Bulletin 82:1-135.

Schwartz, F. J. 1988. Pre- and post-drought fish surveys of selected freshwater ponds located in Nags Head Woods, Nags Head, North Carolina. ASB Bulletin 35:189-198.

Werler, J. A., & J. McCallion. 1951. Notes on a collection of reptiles and amphibians from Princess Anne County, Virginia. American Midland Naturalist 45:245-252.

Wright, J. B., L. G. Musselman, G. F. Levy, and J. L. Kernell. 1990. The vascular flora of Seashore State Park, Virginia Beach, Virginia. Rhodora 92:90-102.

Shorter Contributions

Banisteria, Number 9, 1997

JUVENILE GREEN TURTLES (*CHELONIA MYDAS*) STRANDED BY COLD IN THE CHESAPEAKE BAY — Reports of sea turtles stranded because of cold water temperatures are not uncommon for coastal Atlantic waters north of the Carolinas (Morreale et al., 1992; Shoop & Kenney, 1992). In the Chesapeake Bay of Virginia, USA, stranded sea turtles have been reported for all months outside of the normal activity season (May-October) when juveniles of at least four species (loggerhead [*Caretta caretta*], green turtle [*Chelonia mydas*], hawksbill [*Eretmochelys imbricata*], Kemp's ridley [*Lepidochelys kempii*]) enter the Bay to forage (Keinath et al., 1987; Mitchell, 1994). Sea turtles usually enter and leave the Chesapeake Bay when the water temperature rises above or falls below 18° C (Musick, 1988). Barco & Pitchford (1990) reported that four live *C. caretta* and one live *L. kempii* were found stranded on beaches along the southern end of the Chesapeake Bay and on the Atlantic beach of the City of Virginia Beach, Virginia, between 8 and 14 December 1989. They also noted that five additional loggerheads were found after this period. Although several individuals of *C. mydas* have been recorded for the Chesapeake Bay (Keinath et al., 1987; Keinath & Musick, 1991), reports of stranded green turtles due to cold temperatures in this estuary have not been published.

The earliest *Chelonia mydas* recorded in the waters of the Chesapeake Bay during winter months was a juvenile (National Museum of Natural History, USNM 51212) found on 25 January 1893 at the mouth of the Bay by J.A. Bully. This record was first reported by Reed (1957). The latest record is of a juvenile found on 14 December 1995 on the eastern shore of the Chesapeake Bay about 0.8 km south of Kiptopeke State Park, Northampton County, Virginia by G. Williamson and P. Williamson. The turtle measured 33.9 cm straightline carapace length and 27.9 cm plastron length. It was dead when found but exhibited no obvious signs of injury or decomposition. Water temperatures in the mouth of the Chesapeake Bay, the mouth of the James River, and southwest of Cape Charles on 12 December 1995 were 5.5-6.8°C (n = 6 each depth) at 1 m, 5.7-6.8°C at 5 m, 5.3-7.3°C at 10 m, and 6.1-9.8°C at 15 m. These temperatures, well below those marking annual entry and exit to and from the Bay, and the late dates, suggest that the deaths of the juvenile reported here and the one reported by Reed (1957) were related to cold torpor. If these are rare occurrences, then the losses to the *Chelonia mydas* population off the North American coast may not be severe. However, the continued decline of this species causes even these rare instances of natural mortality to grow in importance.

Acknowledgments

We are indebted to Mike Lane (Old Dominion University, Norfolk, VA) for the temperature data. Jack Musick and Steve Roble commented on earlier drafts of the manuscript.

Literature Cited

Barco, S.G., & T.D. Pitchford. 1990. Field notes: *Caretta caretta* (loggerhead sea turtle) and *Lepidochelys kempi* (Atlantic Ridley sea turtle). Catesbeiana 10:19.